

AMENDMENTS TO THE CLAIMS:

Claims 4-55, 69-70 and 72 were pending at the time of the Office Action.

Claims 1, 26, 28, 39, 43, 45, 55, 69, and 72 are currently amended

Claims 4-55, 69-70, and 72 remain in this application.

1-3 (Previously Canceled)

4. (Currently Amended) A fiber-metal laminate comprising:

~~at least two~~ first and second metallic layers, each metallic layer having an inorganic polymer sol coating formed thereon; and

at least three composite ~~one~~ fiber layers disposed between the first and second metallic layers, a first one of the composite fiber layers being adjacent to the inorganic polymer sol coatings coating of the first metallic layer and a third one of the composite fiber layers being adjacent to inorganic polymer sol coating of the second metallic layer, the first and third composite fiber layers each having a plurality of fibers approximately aligned along a first longitudinal direction, and a second one of the composite fiber layers being disposed between and adjacent to the first and third composite fiber layers and having a plurality of fibers approximately aligned along a second longitudinal direction orthogonal to the first longitudinal direction, wherein each of the three fiber layers contains a thermosetting resin matrix and a plurality of galvanically non-reactive poly diimidazo pyridinylene fibers.

5. (Original) The laminate of Claim 4, wherein the poly diimidazo pyridinylene fibers include poly {2,6-diimida7o [4,5-b4',5'-c] pyridinylene-1,4(2,5-dihydroxy) phenylene} fibers.

6. (Previously Presented) The laminate of Claim 4, wherein the at least two layers include an aluminum alloy.

7. (Previously Presented) The laminate of Claim 6, wherein the aluminum alloy includes a heat treatable aluminum alloy.

8. (Previously Presented) The laminate of Claim 4, wherein the at least two layers include a titanium alloy.

9. (Previously Presented) The laminate of Claim 4, wherein the at least two layers include a stainless steel alloy.

10. (Previously Presented) The laminate of Claim 4, wherein the resin matrix includes an epoxy resin.

11. (Previously Presented) The laminate of Claim 4, wherein the at least two metallic layers constitute no more than 40 percent by weight of the laminate.

12. (Previously Presented) The laminate of Claim. 4, wherein the at least two metallic layers constitute at least 10 percent and no more than 50 percent by volume of the laminate.

13. (Previously Presented) The laminate Claim 4, wherein at least 90 percent of the fibers are substantially aligned in one direction.

14. (Original) The laminate of Claim 13, wherein about 100 percent of the fibers are aligned in the substantially same direction.

15. (Previously Presented) The laminate of Claim 4, wherein at least 10 percent of the fibers are aligned at a first direction 45° from a second direction to which at a majority of the fibers are aligned.

16. (Previously Presented) The laminate of Claim 4, wherein ~~the~~ at least a portion of the fibers are aligned in a plurality of directions.

17. (Previously Presented) The laminate of Claim 4, wherein the fibers include continuous fibers.

18. (Previously Presented) The laminate of Claim 4, which contains at least 3 and no more than 15 metallic layers.

19. (Previously Presented) The laminate of Claim 4 wherein the at least one fiber layer includes between 3 and 15 plies of fibers.

20. (Previously Presented) The laminate of claim 4, wherein the at least two metallic layers each have a thickness of at least 0.004 inch and no more than 0.025 inch.

21. (Previously Presented) The laminate of Claim 4, wherein the surfaces of the metallic layers are pre-treated by phosphoric acid anodizing.

22. (Previously Presented) The laminate of Claim 4, wherein the surfaces of the metallic layers are pre-treated by coating with an interphase layer.

23. (Previously Presented) The laminate of Claim 22, wherein the interphase layer includes a sol-gel surface preparation.

24. (Previously Presented) The laminate of Claim 4 which additionally comprises a layer of an adhesive resin between the fiber layer and the metallic layers, wherein the adhesive resin is different from the resin matrix.

25. (Original) The laminate of Claim 24 wherein the adhesive includes an epoxy adhesive.

26. (Currently Amended) The laminate of Claim 4, further comprising:  
a pair of inner metallic layers disposed between at least two of the composite fiber layers;  
and  
at least one core layer disposed between the pair of inner ~~at least two~~ metallic layers.

27. (Original) The laminate of Claim 26, wherein the core layer includes a honeycomb core.

28. (Currently Amended) A fiber-metal laminate comprising:

~~at least two~~ first and second layers of aluminum alloy, each aluminum alloy layer having an inorganic polymer sol coating formed thereon; and

at least three composite ~~one~~ resin-fiber ~~ply~~ plies bonded between the first and second aluminum alloy layers, a first one of the composite fiber layers being adjacent to the inorganic polymer sol ~~coatings~~ coating of the first aluminum alloy layer and a third one of the composite fiber layers being adjacent to inorganic polymer sol coating of the second aluminum alloy layer, the first and third resin-fiber plies each having a plurality of fibers approximately aligned along a first longitudinal direction, and a second one of the resin-fiber plies being disposed between and adjacent to the first and third resin-fiber plies and having a plurality of fibers approximately aligned along a second longitudinal direction orthogonal to the first longitudinal direction, wherein each of the three ply plies including includes a thermosetting resin matrix and a plurality of galvanically non-reactive poly diimidazo pyridinylene fibers, a majority of the plurality of galvanically non-reactive poly diimidazo pyridinylene fibers of at least one of the resin-fiber plies being aligned along a primary stress direction.

29. (Original) The laminate of Claim 28, wherein the poly diimidazo pyridinylene fibers include poly {2,6-diimidazo [4,5-b4',5'-c] pyridinylene-1,4(2,5-dihydroxy) phenylene} fibers.

30. (Original) The laminate of Claim 28, wherein the aluminum alloy includes a heat treatable aluminum alloy.

31. (Original) The laminate of Claim 28, wherein the resin-fiber ply is bonded between the aluminum alloy layers with an adhesive resin different from the matrix resin.

32. (Original) The laminate of Claim 28, wherein the resin matrix includes an epoxy resin.

33. (Original) The laminate of Claim 28, wherein the metallic layers constitute less than 40 percent by weight of the laminate.

34. (Original) The laminate of Claim 28, wherein the at least two metallic layers constitute between 10 percent and 50 percent by volume of the laminate.

35. (Original) The laminate of Claim 28, wherein at least 90 percent of the fibers are substantially aligned in one direction.

36. (Original) The laminate of Claim 35, wherein about 100 percent of the fibers are aligned in the substantially same direction.

37. (Original) The laminate of Claim 28, having at least 3 and no greater than 15 metallic layers.

38. (Original) The laminate of Claim 28, wherein the at least one fiber layer includes between 3 and 15 layers of aligned polymer fibers.

39. (Currently Amended) The laminate of claim 28, wherein the metallic layers each have thickness of within a range of approximately at least 0.004 inch and approximately 0.025 inch.

40. (Original) The laminate of Claim 28, wherein the surfaces of the metallic layers are pre-treated by phosphoric acid anodizing.

41. (Original) The laminate of Claim 28 wherein, the surfaces of the metallic layers are pre-treated by coating with an interphase layer of resin.

42. (Original) The laminate of Claim 28, wherein the surfaces of the metallic layers are pre-treated with a sol-gel surface preparation.

43. (Currently Amended) The laminate of Claim 28, further comprising:  
a pair of inner metallic layers disposed between at least two of the resin-fiber plies; and  
at least one core layer disposed between the pair of inner ~~at least two~~ metallic layers.

44. (Original) The laminate of Claim 43, wherein the hollow core layer includes a honeycomb core.

45. (Currently Amended) A composite aircraft component comprising:  
~~at least two~~ first and second aluminum alloy foil layers that are pre-treated each having a thickness in a range from 0.004 inches to 0.025 inches, each aluminum alloy foil layer having an inorganic polymer sol coating formed thereon; and  
at least ~~three one~~ polymeric composite fiber layers bonded between the first and second ~~at least two~~ foil layers, a first one of the composite fiber layers being adjacent to the inorganic polymer sol coating of the first aluminum alloy foil layer and a third one of the composite fiber layers being adjacent to inorganic polymer sol coating of the second aluminum alloy foil layer, the first and third composite fiber layers each having a plurality of fibers approximately aligned along a first longitudinal direction, and a second one of the composite fiber layers being disposed

between and adjacent to the first and third composite fiber layers and having a plurality of fibers approximately aligned along a second longitudinal direction orthogonal to the first longitudinal direction, wherein each of the three composite fiber layers including includes a thermosetting resin matrix and a plurality of galvanically non-reactive aligned poly diimidazo pyridinylene fibers, the plurality of galvanically non-reactive poly diimidazo pyridinylene fibers of at least one of the composite fiber layers being aligned along a primary stress direction.

46. (Original) The laminate of Claim 45, wherein the poly diimidazo pyridinylene fibers include poly {2,6-diimidazo [4,5-b4',5'-c] pyridinylene-1,4(2,5-dihydroxy) phenylene} fibers.

47. (Original) The laminate of Claim 45, wherein the resin matrix includes an epoxy resin.

48. (Original) The laminate of Claim 45, wherein the at least two metallic layers constitute no more than 40 percent by weight of the laminate.

49. (Original) The laminate of Claim 45, wherein the at least two metallic layers constitute at least 10 percent and no greater than 50 percent by volume of the laminate.

50. (Original) The laminate of Claim 45, wherein greater than 90 percent of the fibers are substantially aligned in one direction.

51. (Original) The laminate of Claim 45, wherein about 100 percent of the fibers are substantially aligned in one direction.



52. (Original) The laminate of Claim 45, wherein at least 10 percent of the fibers are aligned in a first direction 45° to a second direction a majority of the remaining fibers are aligned.

53. (Original) The laminate of Claim 45, wherein the at least a portion of the fibers are aligned in a plurality of different directions.

54. (Original) The laminate of Claim 45, wherein at least two final layers include at least 3 and no greater than 15 foil layers.

55. (Currently Amended) The laminate of Claim 45, further comprising:  
a pair of inner metallic layers disposed between at least two of the composite fiber layers;  
and  
at least one core layer disposed between the pair of inner metallic layers wherein the at  
~~least one polymeric composite layer includes at least three 3 and no more than 15 polymeric~~  
~~composite layers.~~

56. (Withdrawn) A method for producing a fiber-metal laminate, the method comprising:

providing a plurality of metallic layers;

aligning a plurality of polymer fibers having a modulus of elasticity of greater than 270 GPa into at least one fiber layer; and

sandwiching the at least one fiber layer between the plurality of metallic layers.

57. (Withdrawn) The method of Claim 56, further comprising bonding the at least one high modulus fiber layer to the plurality of metallic layers adjoining the high modulus fiber layer using an adhesive resin different from the matrix resin.

58. (Withdrawn) The method of Claim 56, further comprising pretreating the plurality of metallic layers.

59. (Withdrawn.) The method of Claim 58, wherein pretreating includes pretreating with a sol-gel coating.

60. (Withdrawn) The method of Claim 56, wherein the poly diimidazo pyridinylene fibers include poly {2,6-diimidazo [4,5-b4',5'-c] pyridinylene-1,4(2,5-1hydroxy) phenylene} fibers.

61. (Withdrawn) The method of Claim 56, wherein the plurality of metallic layers include an aluminum alloy.

62. (Withdrawn) The method of Claim. 56, wherein the plurality of metallic layers include a titanium alloy.

63. (Withdrawn) The method of Claim 56, wherein the plurality of metallic layers include a stainless steel alloy.

64. (Withdrawn) The method of Claim 56, wherein the resin matrix includes an epoxy resin.

65. (Withdrawn) The method of Claim 56, wherein the at least two metallic layers constitute less than 40 percent by weight of the laminate.

66. (Withdrawn) The method of Claim 56, wherein the at least two metallic layers constitute between 10 percent and 50 percent by volume of the laminate.

67. (Withdrawn) The method of Claim 56, further comprising forming a hollow core between the plurality of metallic foil layers.

68. (Withdrawn) The method of Claim 67, wherein forming a hollow core includes forming a honeycomb core.

69. (Currently Amended) A fiber-metal laminate produced according to a method comprising:

~~providing a plurality of first and second~~ metallic layers, each metallic layer having an inorganic polymer sol coating formed thereon;

providing at least three composite fiber layers disposed between the first and second metallic layers, each composite fiber layer including aligning a plurality of galvanically non-reactive poly diimidazo pyridinylene fibers having a modulus of elasticity of greater than 270 GPa disposed within into a thermosetting resin, wherein a first one of the composite fiber layers is adjacent to the inorganic polymer sol coating of the first metallic layer and a third one of the composite fiber layers is adjacent to inorganic polymer sol coating of the second metallic layer, the first and third composite fiber layers each having a plurality of fibers approximately aligned along a first longitudinal direction, and a second one of the composite fiber layers being disposed between and adjacent to the first and third composite fiber layers and having a plurality of fibers approximately aligned along a second longitudinal direction orthogonal to the first longitudinal

~~direction of at least one fiber layer the plurality of galvanically non reactive poly diimidazo pyridinylene fibers being aligned along a primary stress direction; and~~  
~~sandwiching the at least one fiber layer between the plurality of metallic layers adjacent to the inorganic polymer sol coatings.~~

70. (Original) The laminate of Claim 69, produced according to the method further comprising bonding the at least one high modulus fiber layer to the plurality of metallic layers adjoining the high modulus fiber layer.

71. (Previously Canceled)

72. (Currently Amended) The laminate of Claim 69, formed by a method further comprising:

forming a pair of inner metallic layers disposed between at least two of the composite fiber layers; and

forming at least one core layer disposed between the pair of inner metallic layers wherein pre-treating includes pre-treating with a sol-gel coating.